(c) *Test No. 2S.* Test No. 1S is repeated using an influent containing approximately 25 percent oil and 75 percent water.

(d) *Test No. 3S.* The separator is fed with oil until oil is discharged at the oil discharge outlet of the separator at essentially the same rate that oil is being fed to the separator. The separator is then fed with oil for five (5) additional minutes. If any oily mixture is discharged from the separated water outlet on the separator during the test, that observation is recorded.

(e) *Test No. 4S.* The separator is fed with water for fifteen (15) minutes. Samples of the separated water effluent are taken at the beginning of the test and after the first ten (10) minutes.

(f) *Test No. 5S.* The separator is operated automatically for three (3) hours. During the test, the separator is continuously fed with an influent varying from water to a mixture of 25 percent oil in water and back to water every fifteen (15) minutes. The oil concentration in the influent is varied in at least five (5) equal increments during each fifteen (15) minute period and the time intervals between the incremental changes are equal. During the last hour, the separator must be inclined at an angle of 22.5° with the plane of its normal operating position. During the last time increment in which the unit is fed a 25 percent oil mixture, a sample of the separated water effluent is taken. If the separator stops at any time during this test, that observation is recorded.

(g) *Test No. 6S.* Tests No. 1S and No. 2S are repeated using, in lieu of a heavy fuel oil in the influent, a light distillate fuel oil having a relative density of approximately 0.83 at 15 °C.

§162.050–25 Cargo monitor: Design specification.

(a) This section contains requirements that apply to cargo monitors.

(b) Each monitor must be designed so that it is calibrated by a means that does not involve manually mixing a known quantity of oil and a known quantity of water to form a mixture and manually feeding the mixture into the monitor.

(c) The electrical components of a monitor that are to be installed in an explosive atmosphere must be approved by an independent laboratory as components that Underwriters Laboratories Standard 913 (dated April 8, 1976) defines as intrinsically safe for use in a Class I, Group D hazardous location.

(d) Each monitor component that is a moving part must be designed so that its movement during operation of the monitor does not cause formation of static electricity.

(e) A monitor must be designed to operate in each plane that forms an angle of 22.5° with the plane of its normal operating position.

(f) Each monitor must be designed in accordance with the applicable requirements contained in subchapters F and J of this chapter.

(g) Each monitor must be designed so that it records each change in oil content of the mixture it is measuring within twenty (20) seconds after the change occurs.

(h) Each monitor must have a device that produces a warning signal and a signal that can be used to actuate valves in a vessel's fixed piping system, when—

(1) The oil content of the mixture being measured exceeds the concentration limit set by the operator of the monitor; and

(2) Malfunction, breakdown, or other failure of the monitor occurs.

(i) Each monitor must have a means to determine whether it is accurately calibrated.

[44 FR 53359, Sept. 13. 1079, as amended by CGD 76–088c, 48 FR 45727, Oct. 6, 1983]

§162.050–27 Cargo monitor: Approval tests.

(a) This section contains requirements that apply to cargo monitors.

(b) *Test conditions.* (1) The tests and each step in the tests must be carried out in the order described in this section. Each test must be performed without time delay between steps in the test.

(2) A test rig of the type described in §162.050–19 must be used in performing each test.

(3) Each mixture used during the tests must be prepared by combining oil supplied from the oil injection pipe

of the test rig and water supplied from the mixture tank of the test rig. However, if the flow of oil through the oil injection pipe becomes intermittent, oil and water may be combined in the mixture tank to form the mixture.

(4) A mixture may be circulated through a monitor only once during testing.

(5) Unless otherwise provided in a specific test, the water used in each test must be clean, fresh water.

(6) The oil used in each test, except Test No. 2CM, must be Arabian light crude oil.

(7) Each test must be performed at an ambient temperature of between 10 °C and 30 °C.

(8) Unless otherwise provided in a specific test, each test must be performed at the maximum mixture pressure, the maximum flow rate, and the power supply ratings at which the monitor is designed to operate.

(9) The particulate contaminant described in Table 162.050–27(g) must be of a type that does not lose more than three (3) percent of its weight after ignition and must be insoluble in a 500 p.p.m. mixture.

(10) In each test the monitor must be operated in accordance with the procedures described in its instructions manual.

(11) Unless otherwise provided in a specific test, the centrifugal pump shown in Figure 162.050–19 must be operated at one thousand (1,000) revolutions per minute or more in each test.

(12) Whenever the oil content of a mixture is recorded, a sample of the mixture must also be taken. The oil content of the sample must be measured using the method described in § 162.050–39.

(13) A one (1) liter sample of each oil to be used in testing must be taken and provided for use in the sample analysis required by § 162.050–39.

(c) *Test No. 1CM.* The cargo monitor is calibrated and zeroed. It is then fed with water for 15 minutes and then with mixtures in the following concentrations: 15 p.p.m., 50 p.p.m., 100 p.p.m., and each additional concentration, in increments of 50 p.p.m. up to the highest oil concentration that can be read on the monitor. Each mixture is fed to the monitor in the order listed for fifteen (15) minutes. Water is fed to the monitor for a (15) minute period between each mixture. At the end of each (15) minute period, an oil content reading is obtained and recorded.

(d) *Test No. 2CM.* (1) If the cargo monitor is designed for use with crude oils, it is fed with a mixture of water and the first oil listed in Table 162.050–27(d) at the following concentrations: 15 p.p.m., 100 p.p.m., and a concentration that is ninety (90) percent of the highest oil concentration in water that can be read on the monitor. Each concentration is fed to the monitor in the order listed until a steady reading occurs and is recorded. After each steady reading is recorded, the monitor is fed with water for fifteen (15) minutes. At the end of each fifteen (15) minute period of feeding the monitor with water, an oil content reading is again obtained and recorded.

(2) The steps described in paragraph (d)(1) of this section are repeating using each of the other oils listed in Table 162.050–27(d).

TABLE 162.050–27(D)—OIL TYPE AND CHARACTERISTICS

Oil type	Characteristics
1. Sahara blend crude oil	Density—low. Viscosity—low. Pour point—very low. Producing country—Algeria. General description—mixed base.
2. Arabian light crude oil	Density—medium. Viscosity—medium. Pour point—low. Producing country—Saudi Arabia. General description—mixed base.
3. Nigerian medium crude oil.	Density—high. Viscosity—medium. Pour point—low. Producing country—Nigeria. General description—naphthenic base.
4. Bachaquero 17 crude oil	Density—very high. Viscosity—very high. Pour point—low. Producing country—Venezuela. General description—asphaltic base.
5. Minas crude oil	Density—medium. Viscosity—high. Pour point—very high. Producing country—Indonesia. General description—paraffinic base.
6. Residual fuel oil	Bunker C or No. 6 Fuel Oil.

(3) If any oil listed in Table 162.050–27(d) is unavailable, an oil with similar properties may be substituted in testing.

(4) If the monitor is to be used with refined oil products, the steps described in paragraph (d)(1) of this section are performed using each of the following:

(i) Leaded regular grade automotive gasoline.

(ii) Unleaded automotive gasoline.

(iii) Kerosene.

(iv) Light diesel or No. 2 fuel oil.

(e) *Test No. 3CM.* (1) The cargo monitor is fed with water, zeroed, and then fed with a 100 p.p.m. mixture. The time at which the monitor first detects oil in the mixture, the times of reading 63 p.p.m. and 90 p.p.m., and the time of reaching the highest steady reading of oil content are recorded. The oil content of the mixture at the highest steady reading is also recorded.

(2) The metering pump is turned off and the time at which the highest reading starts to decrease, the times of reading 37 p.p.m. and 10 p.p.m., and the time of returning to the lowest steady oil content reading are recorded. The oil content of the mixture at the lowest steady reading is also recorded.

(3) The time interval between first detecting oil in the mixture and reading 63 p.p.m., and the time interval between the first decrease in the highest reading and reading 37 p.p.m., are averaged and recorded as the response time for the monitor.

(f) *Test No. 4CM.* (1) The cargo monitor is fed with water, zeroed, and then fed with a mixture containing ten (10) percent oil for one (1) minute. The following times occurring during this procedure are recorded:

(i) Time at which the monitor first detects oil.

(ii) Time of reading 100 p.p.m.

(iii) Time of exceeding the highest oil concentration that can be read on the monitor.

(iv) Time of returning to the highest oil concentration that can be read on the monitor.

(v) Time of returning to a reading of 100 p.p.m.

(vi) Time of returning to the lowest steady oil content reading.

(2) The oil content of the mixture at the lowest steady reading described in paragraph (f)(1)(vi) of this section is recorded.

(3) The monitor is fed with water, zeroed, and then fed with oil for one (1) minute after which the flow of water is resumed. The times described in paragraph (f)(1) of this section are recorded.

(4) The monitor is fed with a 100 p.p.m. mixutre until a steady oil content reading is obtained and recorded.

(g) *Test No. 5CM.* (1) The cargo monitor is fed with a 500 p.p.m. mixture until a steady reading is obtained and recorded.

(2) The monitor is fed with a 500 p.p.m. mixture to which enough sodium chloride has been added to provide a concentration of 60,000 parts per million of sodium chloride in water. The oil content reading, when steady, is recorded.

(3) The monitor is fed with a 500 p.p.m. mixture to which enough of the contaminant described in Table 162.050–27(g) has been added to provide a concentration of 100 parts per million of particulate contaminant in water. The oil content reading, when steady, is recorded.

TABLE 162.050–27(G)—INSOLUBLE PARTICULATE CONTAMINANT; PHYSICAL DESCRIPTION

Particle sizes, microns: Percentage [1]	
0–5	39±2
5–10	18±3
10–20	16±3
20–40	18±3
40–80	9±3

[1] By weight of particle size in contaminant.

(h) *Test No. 6CM.* (1) The cargo monitor is fed with a 100 p.p.m. mixture until a steady oil content reading is obtained and recorded.

(2) The monitor is fed with a 100 p.p.m. mixture that has first passed through the centrifugal pump of the test rig. The pump is run at one fourth (¼) of its design speed. The oil content reading, when steady, is recorded.

(3) The steps described in paragraph (h)(2) of this section are repeated with the pump running at one-half (½) of its design speed and then repeated at its design speed.

(i) *Test No. 7CM.* (1) The steps described in paragraph (h)(1) of this section are repeated.

(2) The temperature of the mixture is adjusted to 10 °C and the flow continued until a steady oil content reading is obtained and recorded.

(3) The steps described in paragraph (i)(2) of this section are repeated with the temperature of the mixture at 65 °C or the highest mixture temperature at which the cargo monitor is designed to operate, whichever is lower.

(j) *Test No. 8CM.* (1) The steps described in paragraph (h)(1) of this section are repeated.

(2) If the monitor has a positive displacement mixture pump, the mixture pressure is lowered to one half of the monitor's maximum design pressure. If the monitor has a centrifugal mixture pump, or is not equipped with a mixture pump, the mixture flow rate is reduced to one-half of the monitor's design flow rate. The reduced flow rate or mixture pressure is maintained until a steady oil content reading is obtained and recorded.

(3) If the monitor has a positive displacement mixture pump, the mixture pressure is increased to twice the monitor's design pressure. If the monitor has a centrifugal mixture pump or does not have a mixture pump, the mixture flow rate is increased to twice the monitor's maximum design flow rate. The increased flow rate or mixture pressure is maintained until a steady oil content reading is obtained and recorded.

(k) *Test No. 9CM.* (1) The steps described in paragraph (h)(1) of this section are repeated.

(2) The water and metering pumps on the test rig are stopped for eight (8) hours after which the steps described in paragraph (h)(1) of this section are repeated.

(l) *Test No. 10CM.* (1) The supply voltage to the cargo monitor is increased to one hundred and ten (110) percent of its design supply voltage. The monitor is then fed a 100 p.p.m. mixture for one (1) hour. At the end of the one (1) hour period, an oil content reading is obtained and recorded.

(2) The steps described in paragraph (l)(1) of this section are repeated with the supply voltage to the monitor lowered to ninety (90) percent of its design supply voltage.

(3) Upon completing the steps described in paragraph (l)(2) of this section, the supply voltage to the monitor is returned to the design rating.

(4) The steps described in paragraphs (l)(1), (l)(2), and (l)(3) of this section are repeated varying each other power supply to the monitor in the manner prescribed in those steps for supply voltage.

(m) *Test No. 11CM.* (1) The monitor is calibrated and zeroed.

(2) The steps described in paragraph (h)(1) of this section are repeated.

(3) A 100 p.p.m. mixture is fed to the monitor for eight (8) hours. At the end of the eight (8) hour period, an oil content reading is obtained and recorded.

(4) The monitor is fed with water until a steady oil content reading is obtained and recorded.

(n) *Test No. 12CM.* (1) All power to the monitor is shut off for one (1) week. After one week the monitor is started, zeroed, and calibrated.

(2) The monitor is fed with a 100 p.p.m. mixture for one (1) hour. An oil content reading is then obtained and recorded.

(3) The monitor is fed with water for one (1) hour. An oil content reading is then obtained and recorded.

(4) The steps described in paragraphs (n)(2) and (n)(3) of this section are repeated three (3) additional times. During the last hour in which the monitor is fed with a 100 p.p.m. mixture, the monitor is inclined at an angle of 22.5° with the plane of its normal operating position.

§ 162.050–29 Bilge monitor: Design specification.

(a) This section contains requirements that apply to bilge monitors.

(b) Each bilge monitor must be designed to meet the requirements of this section and the requirements for a cargo monitor in §§ 162.050–25 (b) through (g) and § 162.050–25(i).

(c) Each bilge monitor must have—

(1) A device that produces a warning signal, and a signal that can be used to actuate stop valves in a vessel's fixed piping system, when the oil content of the mixture being measured exceeds 15 p.p.m. ±5 p.p.m.;

(2) A device that produces a warning signal, and a signal that can be used to actuate stop valves in a vessel's fixed piping system, when the oil content of